Claims

Method and array for measurement of structures of an object

1. A method for measurement of structures of an object by means of a feeler element assigned to a coordinate measuring instrument and brought into contact with the object and whose position is then indirectly or directly determined,
w h e r e i n
the position of the feeler element is determined directly or a position of at least one target assigned directly to the feeler element is determined with an optical system for measurement of the structure of the object.

2. Method according to Claim 1,
w h e r e i n
the feeler element and/or the at least one target is moved towards the object from its side facing towards the sensor.

3. Method according to Claim 1 or Claim 2,
w h e r e i n
the position of the feeler element and/or the at least one target is determined by means of light beams reflecting from and/or shading this/these and/or emanating from the feeler element or target.

4. Method according to at least one of the preceding claims,
w h e r e i n
the feeler element is adjusted with the sensor as a unit.

5. Method according to at least one of the preceding claims,

w h e r e i n

a deflection of the feeler element resulting from the contact with the object is optically determined.

6. Method according to at least one of the preceding claims,

w h e r e i n

the deflection of the feeler element is measured by displacement of its image or of an image of a target on a sensor field.

7. Method according to at least one of the preceding claims,

w h e r e i n

the deflection of the feeler element is determined by evaluation of a contrast function

8. Method according to at least one of the preceding claims,

w h e r e i n

the deflection of the feeler element is determined from a size change of an image of a target resulting from the geometrical-optical correlation between object distance and enlargement.

9. Method according to at least one of the preceding claims,

w h e r e i n

the deflection of the feeler element is determined from apparent size change of a target resulting from loss of contrast due to defocusing.

10. Method according to at least one of the preceding claims,

w h e r e i n

the deflection vertical to the optical axis of an electronic image-processing system is determined by the latter.

11. Method according to at least one of the preceding claims,

w h e r e i n

the spatial position of the feeler element is determined using a two-dimensional measurement system by means of at least three targets assigned thereto.

12. Method according to at least one of the preceding claims,

w h e r e i n

a feeler extension or a section thereof is used as a spatially extended target whose position is measured relative to the feeler body in freely selectable cross-sections.

13. Method according to at least one of the preceding claims,

w h e r e i n

targets arranged on the feeler extension for determining the position of the feeler element are measured by photogrammetry (at least two cameras).

14. Method according to at least one of the preceding claims,

w h e r e i n

the position of the feeler element is measured by photogrammetry (at least two cameras).

15. Array for measurement of structures of an object (12) by means of a feeler assigned to a coordinate measuring instrument and comprising a feeler element (14) and preferably a feeler extension (16, 38),

w h e r e i n

the coordinate measuring instrument (22) comprises a sensor for optical

determination of the feeler element (14) and/or of at least one target directly assigned thereto, and an evaluation unit with which the structure is calculated from the position of the optical system relative to the coordinate system of the coordinate measuring instrument and from the position of the feeler element and/or of the target measured directly using the optical system, and wherein the sensor forms the feeler element with at least one jointly adjustable unit.

16. Array according to Claim 15,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) is designed as a reflector.

17. Array according to at least one of the preceding claims,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) is designed self-emitting.

18. Array according to at least one of the preceding claims,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) is a body such as a ball or cylinder spatially emitting or reflecting a beam.

19. Array according to at least one of the preceding claims,
w h e r e i n
the feeler extension (38) is designed at least in some sections elastic to bending and/or as a light guide or comprising a light guide.

20. Array according to at least one of the preceding claims,
w h e r e i n
the feeler extension (38, 40) or at least a section thereof is the feeler element (14)

and/or the target (46, 48).

21. Array according to at least one of the preceding claims,
w h e r e i n
several targets (46, 48) are assigned to the feeler element (14) and extend preferably from the feeler extension (30) or form sections thereof.

22. Array according to at least one of the preceding claims,
w h e r e i n
the feeler extension (30) is designed L-shaped for alignment with an optical axis (24).

23. Array according to at least one of the preceding claims,
w h e r e i n
the feeler extension (30) is designed at the end as a feeler element (14).

24. Array according to at least one of the preceding claims,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) are interchangeably connected to the feeler extension (30).

25. Array according to at least one of the preceding claims,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) are connected to the feeler extension (30) by gluing or welding.

26. Array according to at least one of the preceding claims,
w h e r e i n
the feeler (18) extends from a holder (20) that is adjustable by at least three degrees

of freedom, preferably five, and preferably interchangeable.

27. Array according to at least one of the preceding claims,
w h e r e i n
the feeler (18) extends from a holder (20) that forms a unit with the sensor or is connected to the sensor.

28. Array according to at least one of the preceding claims,
w h e r e i n
the feeler (18) is moved towards the object from its side facing towards the sensor.

29. Array according to at least one of the preceding claims,
w h e r e i n
the feeler element (14) and/or the target (46, 48, 50) has or is a self-lighting electronic element such as an LED.

30. Array according to at least one of the preceding claims,
w h e r e i n
the sensor is an image-processing sensor.

31. Array according to at least one of the preceding claims,
w h e r e i n
the sensor is a position-sensitive surface sensor.

32. Array according to at least one of the preceding claims,
w h e r e i n
the diameter of the feeler element (14) is about 1 to 3 times greater than that of the feeler extension (38).

33. Array according to at least one of the preceding claims,

w h e r e i n

the feeler extension (30) has at its end a cylindrical form and is designed as a feeler element (14).

34. Array according to at least one of the preceding claims,

w h e r e i n

the feeler extension (30) is spherically rounded for formation of the feeler element.